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FRUITS ATTRACTIVE TO BIRDS - SOUTHEASTERN STATES

REGION No. 9

[Arkansas, Tennessee, North Carolina, Louisiana, Mississippi,  
Alabama, Georgia, and South Carolina.]

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REGIONS FOR WHICH LEAFLETS ON FRUITS ATTRACTIVE TO BIRDS ARE AVAILABLE

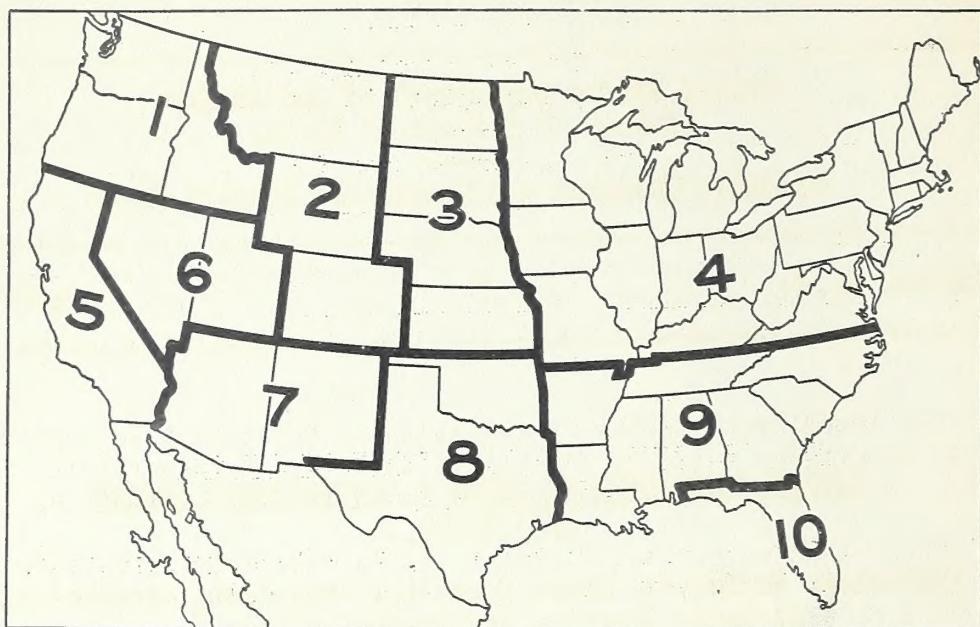


FIGURE 1.--Map of the United States, showing the 10 regions used in presenting information on fruits attractive to birds.

As an aid in requesting leaflets, it should be noted that No. BS-41 is for region 1; BS-42, for region 2, etc., with BS-50 for region 10.

## INTRODUCTION

The Southeastern States, as here restricted, have a flora distinctly justifying their treatment as a separate region. As in cases of other districts, however, there is overlapping of plant distributions on all margins. Persons living near the borders can take advantage of recommendations made for the neighboring region as well as for their own. In the Southeastern States the southern Appalachian highlands also require special treatment; here plants recommended for the northeastern region, particularly for the southern portion thereof, may well be used. See B.S. Leaflet No. 44.

The immediate vicinity of the Atlantic Coast in this region presents conditions suitable for plants that thrive in northern Florida. Names of those plants may be found in B.S. Leaflet No. 50.

Table 1 shows groups of fleshy fruits most attractive to birds throughout the United States and lists desirable kinds of birds most fond of the fruit. No barberries, currants, or buckthorns are listed, because they harbor rusts destructive to plants of economic importance. Junipers are in almost the same category, as they serve as alternate hosts for apple rust, but there is no reason why they cannot be used in districts where apples are not commercially grown, as they are among the most valuable plants for wildlife. Omitted also are plants poisonous to man on contact, as poison ivy and poison sumac, as well as various kinds dangerously poisonous to domestic animals, as yews, wild cherries, and nightshades, in spite of the fact that wild cherries are greatly relished by birds. Browsing animals are known to have been killed by feeding on the leaves of wild cherries but do not seem to be so seriously affected by those of plums. Certain plants included among fleshy fruit bearers in previous publications have been transferred to the list of seed producers, hence do not appear in the present series of leaflets. These include magnolia (Magnolia), bittersweet (Celastrus), and burningbush (Euonymus).

It should be noted that the fruit-bearing seasons recorded, being collected from varied sources, tend to be maxima. As a rule they are not likely to be realized or even approached in a single locality unless numerous specimens of a given species are present and so distributed in sun and shade as to favor both early and late fruiting.

The word "extralimital" as here used in the heading of table 3 covers plants from other States or regions of the United States as well as wholly introduced, exotic, or foreign plants.

TABLE 1. - Groups of fleshy fruits <sup>1/</sup> most attractive to birds throughout the United States

Name of fruit		Species of birds known to eat the fruit	
Common	Generic	Number	Desirable kinds most fond of the fruit
Juniper; redcedar <sup>3/</sup>	<i>Juniperus</i> ....	50	Flicker, mockingbird, robin, eastern bluebird, cedar waxwing, myrtle warbler, evening and pine grosbeaks, purple finch.
Greenbrier .....	<i>Smilax</i> .....	43	Mockingbird, catbird, brown thrasher, robin, hermit thrush, cardinal.
Bayberry .....	<i>Myrica</i> .....	85	Bobwhite, flicker, downy woodpecker, eastern phoebe, tree swallow, black-capped chickadee, Carolina wren, catbird, brown thrasher, hermit thrush, eastern bluebird, white-eyed vireo, myrtle warbler, meadowlark, towhee.
Hackberry .....	<i>Celtis</i> .....	47	Flicker, yellow-bellied sapsucker, mockingbird, brown thrasher, robin, eastern bluebird, cedar waxwing, cardinal.
Mulberry .....	<i>Morus</i> .....	59	Yellow-billed cuckoo, red-bellied, red-headed, and downy woodpeckers, eastern kingbird, mockingbird, catbird, robin, wood thrush, cedar waxwing, red-eyed vireo, yellow warbler, orchard and Baltimore orioles, scarlet tanager, cardinal, purple finch.
Pokeberry .....	<i>Phytolacca</i> ...	52	Mourning dove, flicker, eastern kingbird, mockingbird, catbird, robin, hermit, olive-backed, and gray-cheeked thrushes, eastern bluebird, cardinal.
Spicebush .....	<i>Benzoin</i> .....	17	Eastern kingbird, wood thrush, veery, red-eyed vireo.
Sassafras .....	<i>Sassafras</i> ....	18	Bobwhite, eastern kingbird, catbird, robin, veery, red-eyed vireo.
Strawberry .....	<i>Fragaria</i> ....	52	Catbird, brown thrasher, robin, wood thrush, towhee.

TABLE 1. - Groups of fleshy fruits most attractive to birds throughout the United States--Continued

Name of fruit		Species of birds known to eat the fruit	
Common	Generic	Number	Desirable kinds most fond of the fruit
Raspberry, black- berry	<i>Rubus</i> .....	146	Ruffed grouse, bobwhite, flicker, red- headed woodpecker, eastern kingbird, tufted titmouse, wren tit, mockingbird, catbird, brown thrasher, robin, wood and olive-backed thrushes, eastern bluebird, cedar waxwing, red-eyed vireo, orchard and Baltimore orioles, cardinal, rose- breasted, black-headed, and pine grosbeaks, red-eyed, spurred, and California towhees, white-throated, fox, and song sparrows.
Rose .....	<i>Rosa</i> .....	38	Ruffed and sharp-tailed grouse, prairie chicken, bobwhite.
Mountain-ash .....	<i>Sorbus</i> .....	13	Red-headed woodpecker, catbird, brown thrasher, robin, Bohemian and cedar waxwings, Baltimore oriole, evening and pine grosbeaks.
Chokeberry .....	<i>Aronia</i> .....	21	Brown thrasher, meadowlark.
Hawthorn .....	<i>Crataegus</i> ...	39	Ruffed grouse, robin, purple finch, pine grosbeak.
Apple .....	<i>Malus</i> .....	43	Ruffed grouse, ring-necked pheasant, mockingbird, robin, cedar waxwing, purple finch, pine grosbeak, red crossbill.
Juneberry .....	<i>Amelanchier</i> .	42	Flicker, catbird, robin, hermit thrush, veery, cedar waxwing, Baltimore oriole.
Sumac <sup>4/</sup> .....	<i>Rhus</i> .....	97	Ruffed grouse, bobwhite, valley quail, northern and red-shafted flickers, red- bellied and downy woodpeckers, phoebe, black-capped and Carolina chickadees, wren tit, Carolina wren, mockingbird, catbird, brown and California thrashers, robin, hermit thrush, eastern bluebird, white-eyed vireo, towhee, Audubon's warbler, goldfinch, golden-crowned sparrow.
Pepperberry .....	<i>Schinus</i> .....	12	Robin, varied and hermit thrushes, cedar waxwing, phainopepla.

TABLE 1. - Groups of fleshy fruits most attractive to birds throughout the United States--Continued

Name of fruit		Species of birds known to eat the fruit	
Common	Generic	Number	Desirable kinds most fond of the fruit
Holly .....	Ilex .....	48	Ruffed grouse, bobwhite, valley quail, flicker, yellow-bellied sapsucker, mockingbird, catbird, brown thrasher, robin, hermit thrush, eastern bluebird, cedar waxwing.
Supplejack.....	Berchemia ...	15	Mockingbird, robin.
Grape .....	Vitis .....	87	Ruffed grouse, bobwhite, northern and red-shafted flickers, pileated and red-bellied woodpeckers, eastern kingbird, mockingbird, catbird, brown thrasher, robin, wood thrush, veery, eastern and western bluebirds, cedar waxwing, cardinal.
Virginia creeper .	Ampelopsis ..	38	Flicker, red-bellied and red-headed woodpeckers, yellow-bellied sapsucker, tufted titmouse, mockingbird, brown thrasher, robin, hermit, olive-backed, and gray-cheeked thrushes, eastern bluebird, red-eyed vireo, scarlet tanager, evening grosbeak, purple finch.
Buffaloberry .....	Shepherdia ..	18	Sharp-tailed grouse, pine grosbeak.
Silverberry, Rus- sian olive, etc.	Elaeagnus ...	5/	Prairie chicken, sharp-tailed grouse, catbird, robin, cedar waxwing.
Wild-sarsaparilla	Aralia .....	16	Bobwhite, robin.
Dogwood .....	Cornus .....	93	Ruffed grouse, bobwhite, northern and red-shafted flickers, downy woodpecker, eastern kingbird, catbird, brown thrasher, robin, wood, hermit, olive-backed, and gray-cheeked thrushes, eastern bluebird, cedar waxwing, red-eyed and warbling vireos, cardinal, evening and pine grosbeaks, purple finch, white-throated and song sparrows.
Sourgum, tupelo ..	Nyssa .....	39	Flicker, robin, olive-backed and gray-cheeked thrushes, cedar waxwing, purple finch.
Crowberry .....	Empetrum .....	40	Pine grosbeak, snow bunting.
Bearberry, manza- nita	Arctostaphylos	34	Dusky and ruffed grouse, valley and mountain quail, wren tit, fox sparrow.

TABLE 1. - Groups of fleshy fruits most attractive to birds throughout the United States--Continued

Name of fruit		Species of birds known to eat the fruit	
Common	Generic	Number	Desirable kinds most fond of the fruit
Wintergreen .....	Gaultheria ..	10	Ruffed grouse, wren tit.
Huckleberry .....	Gaylussacia .	46	Robin, pine grosbeak, towhee.
Blueberry .....	Vaccinium ...	93	Ruffed grouse, valley quail, eastern kingbird, black-capped chickadee, tufted titmouse, catbird, brown thrasher, robin, hermit thrush, eastern bluebird, cedar waxwing, orchard oriole, pine grosbeak, towhee.
Beautyberry .....	Callicarpa .	11	Mockingbird, brown thrasher.
Partridgeberry ...	Mitchella ...	10	Ruffed grouse.
Elderberry .....	Sambucus ....	118	Valley quail, flicker, red-headed wood-pecker, eastern and Arkansas kingbirds, black phoebe, wren tit, mockingbird, catbird, brown and California thrashers, robin, olive-backed thrush, eastern and western bluebirds, phainopepla, red-eyed vireo, rose-breasted and black-headed grosbeaks, California towhee, white-crowned sparrow.
Snowberry, coral-berry	Symporicarpus	33	Sharp-tailed grouse, varied thrush, evening and pine grosbeaks.
Blackhaw, cranberrybush	Viburnum ....	35	Ruffed grouse, yellow-billed cuckoo, flicker, catbird, brown thrasher, robin, eastern bluebird, cedar waxwing, rose-breasted grosbeak, purple finch.
Honeysuckle .....	Lonicera ....	18	Bobwhite, catbird, brown thrasher, robin, hermit thrush, pine grosbeak, white-throated sparrow.

1/ Barberries (Berberis), buckthorns (Rhamnus), and currants (Ribes) are omitted because they serve as alternate hosts of rusts, attacking wheat, oats, and white pine, respectively. Yews (Taxus), wild cherries (Prunus), and nightshades (Solanum) also are omitted as being dangerous stock poisoning plants.

2/ When 10 or more.

3/ Carries apple rust; should not be planted near valuable orchards.

4/ Only nonpoisonous species of sumac are considered.

5/ Data given are based entirely on field observations; total number of birds eating the various species of Elaeagnus unknown.

TABLE 2. -- Generally distributed native fruits of the Southeastern States  
for which satisfactory data on fruiting seasons are available

Common name	Scientific name	Fruiting season
Redcedar -----	<i>Juniperus virginiana</i> -----	All year.
Greenbrier -----	<i>Smilax lanceolata</i> -----	Mid-June to mid-May.
Do. -----	<i>Smilax rotundifolia</i> -----	Early July to late April.
Southern waxmyrtle -----	<i>Myrica cerifera</i> -----	All year.
Sugarberry -----	<i>Celtis mississippiensis</i> -	Do.
Pokeberry -----	<i>Phytolacca americana</i> -----	Late May to late October.
Coralbead -----	<i>Cebatha carolina</i> -----	Mid-July to late April.
Sassafras -----	<i>Sassafras sassafras</i> -----	Mid-July to early October.
Spicebush -----	<i>Benzoin aestivale</i> -----	Mid-June to late March.
Sand blackberry -----	<i>Rubus cuneifolius</i> -----	Mid-May to early July.
Southern dewberry -----	<i>Rubus trivialis</i> -----	Early April to late May.
Pasture rose -----	<i>Rosa humilis</i> -----	Early June to late October.
Cherokee rose -----	<i>Rosa laevigata</i> -----	Early August to mid-March.
Red chokeberry -----	<i>Aronia arbutifolia</i> -----	Mid-August to late March.
Serviceberry -----	<i>Amelanchier canadensis</i> ---	Early May to late July.
Hawthorn -----	<i>Crataegus apiifolia</i> -----	Mid-July to mid-November.
Do. -----	<i>Crataegus viridis</i> -----	Early September to mid-May.
Hog plum -----	<i>Prunus umbellata</i> -----	Mid-June to mid-October.
Fragrant sumac -----	<i>Rhus aromatica</i> -----	All year.
Dwarf sumac -----	<i>Rhus copallina</i> -----	Mid-September to mid-May.
Possomhaw -----	<i>Ilex decidua</i> -----	All year.
Inkberry -----	<i>Ilex glabra</i> -----	All year.
Winterberry -----	<i>Ilex verticillata</i> -----	Mid-July to late December.
Yaupon -----	<i>Ilex vomitoria</i> -----	Mid-July to late April.
Holly -----	<i>Ilex opaca</i> -----	All year.
Supplejack -----	<i>Berchemia scandens</i> -----	Early August to late March.
Summer grape -----	<i>Vitis aestivalis</i> -----	Mid-June to late October.
Frost grape -----	<i>Vitis cordifolia</i> -----	Mid-July to mid-October.
Winter grape -----	<i>Vitis cinerea</i> -----	Late August to late May.
Peppervine -----	<i>Ampelopsis arborea</i> -----	Early June to late November.
Sourgum -----	<i>Nyssa sylvatica</i> -----	Late June to mid-November.
Dogwood -----	<i>Cornus stricta</i> -----	Mid-August to late October.
Flowering dogwood -----	<i>Cornus florida</i> -----	Mid-July to late December.
Dangleberry -----	<i>Gaylussacia frondosa</i> -----	Early June to late July.
Fuckleberry -----	<i>Batodendron arboreum</i> -----	All year.
Highbush blueberry -----	<i>Vaccinium corymbosum</i> -----	Early June to late September.
Blueberry -----	<i>Vaccinium myrsinites</i> -----	Mid-April to late June.
Persimmon -----	<i>Diospyros virginiana</i> -----	Mid-July to late December.
Bumelia -----	<i>Bumelia lanuginosa</i> -----	Early September to mid-February.
Adelia -----	<i>Forestiera ligustrina</i> ---	Mid-July to early October.
Beautyberry -----	<i>Callicarpa americana</i> -----	Early July to mid-January.
Partridgeberry -----	<i>Mitchella repens</i> -----	All year.
Elderberry -----	<i>Sambucus canadensis</i> -----	Mid-July to late October.
Smooth with-rod -----	<i>Viburnum nudum</i> -----	All year.
Southern blackhaw -----	<i>Viburnum rufidulum</i> -----	Early June to late April.
Trumpet honeysuckle --	<i>Lonicera sempervirens</i> ---	Mid-June to late September.

Notes supplementary to Table 2

A more southern species of redcedar (Juniperus lucayana) may be substituted.

Saw palmetto (Serenoa serrulata) grows through most of the region near the coast; dwarf palmetto (Sabal minor), from South Carolina to Louisiana. Their fruits are persistent.

Various other greenbriers, including Smilax laurifolia, S. auriculata, S. glauca, S. walteri, S. pseudochina, and S. pumila, also may be used. The fruit of all is long persistent.

Bayberry (Myrica carolinensis) and dwarf waxmyrtle (Myrica pumila) are native near the coast.

Other hackberries (Celtis georgiana and C. occidentalis) are good substitutes.

Mulberries -- Morus rubra is native, and the introduced M. alba and M. nigra will grow throughout the region. They bear fruit for about a month in early summer.

Dewberries, blackberries, raspberries (Rubus) -- Any native species of the genus may be used.

Fragaria -- Wild strawberries are a good source of bird food in early summer.

Rosa -- Any local species can be transplanted; those with the smaller sizes of fruits are most used by birds.

Chokeberries -- A. atropurpurea or A. nigra will do just as well.

Crataegus -- All of the numerous species have value for bird food; those with the smaller fruits and holding them longest are of most importance. C. rufula is notable for early ripening (May).

Firethorn (Cotoneaster pyracantha), introduced, also may be used.

Plums -- Locally available species may be transplanted.

Deer plum (Chrysobalanus oblongifolia) will grow near the coast.

Chinaberry (Melia azedarach) has a bearing season extending from early fall to late spring.

Rhus -- Other native species, mostly with shorter bearing seasons, may be substituted.

Ampelopsis -- The Virginia creeper (Ampelopsis quinquefolia) grows throughout the region, keeps its fruit well through the winter, and is a good bird food.

Passionflowers (Passiflora incarnata and P. lutea) are widely distributed vines producing pulpy berries.

Hercules-club (Aralia spinosa) and wild spikenard (Aralia racemosa) will grow in most parts of the region.

Nyssa -- N. sylvatica is scheduled because it is an upland species; N. biflora with similar fruit grows in wet places in the Southeastern States.

Cornus -- Any of the bushy native or introduced species are useful.

Gaylussacia -- G. dumosa, an equivalent, more local species, can just as well be used.

Vaccinium -- All of the blueberries are valuable.

Bumelia -- Bumelia lycioides of similar range appears to have much less persistent fruit.

American olive (Osmanthus americanus) grows near the coast; fringetree (Chionanthus) has some value in producing bird food.

Lantana (L. camara), an introduced plant that grows almost anywhere along the Gulf coast, has some value as bird food.

Matrimony-vine (Lycium carolinianum) will grow near the coast.

Viburnum -- Local species will serve. Fruiting seasons in most cases are not so long as for those entered in the table.

Other honeysuckles will serve -- L. japonica, introduced and often a weed, is used as a soil-binding plant. It holds fruit into the winter.

TABLE 3. -- Extralimital fruits that have been recommended for Mississippi

Common name	Scientific name	Fruiting season
Common juniper -----	<i>Juniperus communis</i> -----	
Chinese juniper -----	<i>Juniperus chinensis</i> & vars.	
Greek juniper -----	<i>Juniperus excelsa</i> & vars. --	
Creeping juniper -----	<i>Juniperus horizontalis</i> -----	
Black mulberry -----	<i>Morus nigra</i> -----	
Fiveleaf akebia -----	<i>Akebia quinata</i> -----	
Nandina -----	<i>Nandina domestica</i> -----	
Camphor-tree -----	<i>Cinnamomum camphora</i> -----	
Peking cotoneaster --	<i>Cotoneaster acutifolia</i> -----	
Box cotoneaster -----	<i>Cotoneaster buxifolia</i> -----	
Spreading cotoneaster -----	<i>Cotoneaster divaricata</i> -----	
Rock cotoneaster -----	<i>Cotoneaster horizontalis</i> --	
Rockspray -----	<i>Cotoneaster microphylla</i> ---	
Narrowleaf firethorn -----	<i>Pyracantha angustifolia</i> ---	
Laland firethorn -----	<i>Pyracantha coccinea</i> var. -- lalandi.	All winter.
Nepal firethorn -----	<i>Pyracantha crenulata</i> var. - yunnanensis.	
Cockspur thorn -----	<i>Crataegus crusgalli</i> -----	
English thorn -----	<i>Crataegus monogyna</i> -----	
Dwarf thorn -----	<i>Crataegus uniflora</i> -----	
Japanese flowering crab	<i>Malus floribunda</i> -----	

TABLE 3. -- Extralimital fruits that have been recommended for Mississippi --  
Continued

Common name	Scientific name	Fruiting season
Cherokee rose -----	<i>Rosa laevigata</i> -----	
Japanese rose -----	<i>Rosa multiflora</i> -----	
Sweetbrier rose -----	<i>Rosa rubiginosa</i> -----	
Rugosa rose -----	<i>Rosa rugosa</i> -----	
Wichurian rose -----	<i>Rosa wichuriana</i> -----	
English holly -----	<i>Ilex aquifolium</i> -----	
Chinese holly -----	<i>Ilex cornuta</i> -----	
Japanese holly -----	<i>Ilex crenata</i> -----	
Fragrant sumac -----	<i>Rhus canadensis</i> -----	
Jujube -----	<i>Zizyphus vulgaris</i> -----	
Japanese creeper -----	<i>Ampelopsis tricuspidata</i> & vars.	
Thorny elaeagnus -----	<i>Elaeagnus pungens</i> & vars. -	
Autumn elaeagnus -----	<i>Elaeagnus umbellata</i> -----	
Pagoda dogwood -----	<i>Cornus alternifolia</i> -----	
Cornelian cherry -----	<i>Cornus mas</i> -----	
Red-osier -----	<i>Cornus stolonifera</i> & vars.-	
Strawberry-tree -----	<i>Arbutus unedo</i> -----	
Wintergreen -----	<i>Gaultheria procumbens</i> -----	
Holly osmanthus -----	<i>Osmanthus aquifolium</i> -----	
Fortune osmanthus -----	<i>Osmanthus fortunei</i> -----	
Sweet osmanthus -----	<i>Osmanthus fragrans</i> -----	
Amur privet -----	<i>Ligustrum amurense</i> -----	
Ibota privet -----	<i>Ligustrum ibota</i> -----	
Japanese privet -----	<i>Ligustrum japonicum</i> -----	
Glossy privet -----	<i>Ligustrum lucidum</i> & vars. -	
Nepal privet -----	<i>Ligustrum nepalense</i> -----	
Chinese privet -----	<i>Ligustrum sinense</i> & vars. -	
European privet -----	<i>Ligustrum vulgare</i> -----	
Chinese beautyberry -----	<i>Callicarpa purpurea</i> -----	
Lilac chaste-tree -----	<i>Vitex agnus-castus</i> -----	
Snowberry -----	<i>Symporicarpos racemosus</i> --	
American cranberrybush --	<i>Viburnum americanum</i> -----	
Fragrant viburnum -----	<i>Viburnum carlesi</i> -----	
Sweet viburnum -----	<i>Viburnum odoratissimum</i> -----	
European cranberrybush --	<i>Viburnum opulus</i> -----	
Leatherleaf viburnum -----	<i>Viburnum rhytidophyllum</i> ---	
White belle honeysuckle -----	<i>Lonicera bella</i> var. <i>albida</i>	
Winter honeysuckle -----	<i>Lonicera fragrantissima</i> ---	
Everblooming honeysuckle -----	<i>Lonicera heckrottii</i> -----	
Japanese honeysuckle -----	<i>Lonicera japonica</i> & vars. -	
Amur honeysuckle -----	<i>Lonicera maackii</i> -----	
Morrow honeysuckle -----	<i>Lonicera morrowi</i> -----	
Privet honeysuckle -----	<i>Lonicera pileata</i> -----	
Manchurian honeysuckle -----	<i>Lonicera ruprechtiana</i> -----	
Tatarian honeysuckle -----	<i>Lonicera tatarica</i> -----	

## LITERATURE

Publications of interest in connection with fruits for the Southeastern States include:

### Region

Trees of the Southeastern States. Including Virginia, North Carolina, South Carolina, Georgia, and northern Florida. By William C. Coker and Henry R. Totten. 399 pp., illus., 1934. Inquire as to price from the University of North Carolina Press, Chapel Hill, N. Car.

Manual of the Southeastern Flora, by John K. Small. 1554 pp., illus., 1935. [Covers the area from North Carolina to Florida and Louisiana.] Inquire as to price from the author, Botanic Garden, New York, N. Y.

### Georgia

Beautifying Georgia roads, by T. H. McHatton. State Agr. Coll. Coop. Ext. Work, Vol. 19, No. 404, May 1931, 28 pp., illus. Inquire as to conditions governing distribution from the State College of Agriculture, Athens, Ga.

### Mississippi

Beautifying home grounds, by H. M. McKay. Coop. Ext. Leaflet 5 (revised), 18 pp. mimeographed, February 1935. Inquire as to conditions governing distribution from the Mississippi State College, State College, Miss.

### South Carolina

Notes on conservation in South Carolina. Garden Club of South Carolina, 20 pp., 1932. [Contains lists of native shrubs suitable for gardens and of those recommended for attracting birds.] Inquire as to conditions governing distribution from the South Carolina Federation of Women's Clubs, Aiken, S. Car.

### Tennessee

How to grow and transplant trees and shrubs, by W. C. Pelton. Tenn. Agr. Ext. Serv. Publ. 178, 8 pp., illus., June 1933. Inquire as to conditions governing distribution from the University of Tennessee, Knoxville, Tenn.